

Road Safety Audit of Balsamand-Hisar Bypass Road (MDR 107)

Ravi Saharan¹, Vikas²

¹Research Scholar, ²Assistant Professor,

^{1,2}Department of Civil Engineering, Om Institute of Technology & Management, Hisar, Haryana, India

ABSTRACT

Now a days, in each ten minutes, we tend to lose one human life because of road accidents. Within the world, Bharat has world's largest weighty traffic and accidents too it's necessary to provide the safety to roads. Road Safety Audit (RSA) could be a practice or methodology within which identification of existing or future road on basis of questions of safety and provision of safety remedial measures on that.

Road Safety Audit (RSA) is a formal method for assessing accident potential and safety performance within the provision of latest road schemes and schemes for the improvement and maintenance of existing roads.

In this study, the section of road from "Balsamand – Hisar Bypass Road (MDR 107)" is undertaken. Road taken having appreciable traffic throughout day time and a few black spots on the road wherever accidents could happen and in-depth analysis of road from "Balsamand – Hisar Bypass Road (MDR 107)" is administered on the premise of information assortment like traffic behaviour study, road safety signs and symbols, etc.

The purpose of study is to examine the road within the terms of the security measures, road situation, any kind of flaws and to counsel the alleviative and preventive actions for the chosen section of road for audit.

How to cite this paper: Ravi Saharan | Vikas "Road Safety Audit of Balsamand-Hisar Bypass Road (MDR 107)" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-6 | Issue-5, August 2022, pp.11-18, URL: www.ijtsrd.com/papers/ijtsrd50419.pdf



Copyright © 2022 by author(s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



INTRODUCTION

In this day and age road and transport has turned into a basic piece of every person. Road, in one form or the another i.e. Directly or indirectly is used by every person in today's era. This transportation network has made us close to every place in terms of travelling but with increase in speed it has also increased the risk of collision i.e. Accident or crash possibility. Per annum accidents on the road networks leads to cost of too many lives and a lot of injuries to corers of individuals. In our country India only nearly 135000 to 150000 people are losing their lives per annum in road accidents i.e. 13 per cent of the whole accidents happening all over the globe. Generally, 3 types of accidents are there categorised on the basis of their effects or seriousness, casualty, injury and property damage only. Person having the control of the vehicle delivers an important role in majority of the accidents. The most of the accidents happens because of 2 principal causes, first is the recklessness of driver

and the second is, unawareness of the road user about the road safety aspects. Therefore, the road safety awareness should be spread among all road users because it is as important as the other elementary skills of existence.

ABOUT ROAD SAFETY

Road user safety defines the different types of methods and precautionary measures used for the purpose of minimising the danger of people being killed or getting injured by using any particular road network. The person using any road may be a pedestrian, cyclist, motorists, their travelling partners, or the public travelling in the public transport i.e. the buses and other services. A design should be called safe when it provides a safer environment to the vehicle making sure that speed of the vehicle using that road in under the driver's control and within the safe limits. Road safety may be an advanced issue and

there are a high variety of things and indicators concerned within the accidents. The matter itself is underestimated in several countries, particularly in developing countries where the problem is difficult.

INDIAN SCENARIO

In India transportation is heavily obsessed with the road network. In 1990s, Bharat was among the highest nations with raising economy because of urbanization. It has influenced within the rise of traffic volume on road. National highways of India are only 2 percent of the total road network however carries about 40 % of the whole road traffic. It influenced in increase of the whole world's vehicles and road accidents. Through, India has only one of the whole world's vehicle that accounts for Sixteen percent of the whole world's accidents deaths (Punetha, Kumar and Mehta, 2012) road traffic accidents that are usually unintentional and preventable are a typical risk on a daily basis to life that may happen to virtually each one, anywhere. The matter of road traffic accident is progressively

changing into a threat to public health and national development in several developing countries. Road traffic accident contributes to economic condition by inflicting deaths, injuries, disabilities, grief, loss of productivity and material damage.

Statistical projection shows that in the period between 2000 and 2021, fatalities associated with traffic accidents can decrease with about 30 percent in high income countries. The alternative pattern is predicted in developing countries, wherever traffic accidents are expected to extend at a quick rate within the years to come. A study done in Kolkata, India, reported that there are some host (human) factors (such as the behaviour of drivers, pedestrians and peddler behaviours) and seasonal factors (weather and time) that contribute to fatal road traffic accidents.

Table shows the worsening scenario of road accident fatalities and injuries in Haryana. Accident prevention is often increased by the appliance of road safety audit over the road network at its different stages of development.

Table - Annual Road Crash Data (Haryana)

Year	Accidents	Fatal	Injury
2020 (up to june 2020)	4024	1854	3391
2019	10944	5057	9362
2018	11238	5118	10020
2017	11258	5120	10339
2016	11234	5024	10531
2015	11174	4879	10794
2014	10676	4483	8944
2013	10482	4517	9143
2012	10065	4446	9452
2011	11128	4762	9727
2010	11195	4719	9905
2009	11915	4603	10481
2008	11596	4494	10570
2007	11998	4415	10288
2006	10314	4012	9118

Source – Government of Haryana, Transport Department

OBJECTIVES

The principle goal of this theory was to detect the safety inadequacies and other hazards and propose the economical and worthy therapeutic activities for the general safety enhancement of Balsamand-Hisar Bypass Road (MDR 107) following Road Safety Auditing procedure.

The precise aims of this study are:

1. To perform Road Safety check on selected passage.
2. To prioritize the dangerous stretches to interference.
3. To dodge the likelihood of the scheme giving escalation to accidents elsewhere in the highway network.
4. To examine possible safety hazards using road safety auditing tactic and to recommend conceivable options for remedial action.

SCOPE OF THE STUDY

- This report comprises identification of the discrepancy of traffic signs/markings, geometrical discrepancy and other road accessories in the existing situation of accident incidence and recognize the need of speed

regulation / substitute measures of traffic management to access the existing segment with respect to the standard IRC.

- Identification of the Black spot by using an accident statistic and listing the unsafe zone for interference.

REVIEW OF RESEARCH PAPERS

S Dorokhin1, V A Zelikov1, E V Starkov (2019) The article analyzes the accident rate in various regions of the Russian Federation based on the results of the five-year period 2015-2019, the main periods of time are identified for which a significant number of road accidents are characteristic. The main directions of activities to reduce the accident rate in certain periods of time are determined, practical recommendations and solutions are proposed. In general, the use of a detailed approach to the analysis of accidents makes it possible to concretize certain types of incidents and develop measures to reduce or completely eliminate them. Evaluation of statistical data is one of the constituent parts in the organization and maintenance of road safety. After all, thanks to the analysis of statistics, it is possible to assess the accident rate, as well as the number of incidents and their causes. Thus, we can identify the main factors that significantly affect the risk of accidents when solving the problem of improving road safety. In order to significantly reduce the number of accidents on the roads, it is necessary to conduct an analysis, according to data taken from the State Statistics, on the basis of which conclusions can be drawn about how the number of accidents changes over several years, and whether there is a dependence of the number of accidents on time days. After analyzing all the data, it is possible to determine the mathematical dependence of such quantities as the number of accidents on the time of day, in order to determine and further develop measures to reduce the accident rate at certain time intervals.

Tummala Bharat Kumar, ChukkapalliJeswanthChowdary (2018) Road safety audit is comparatively an extra ordinary tool for the improvement of road safety and to recognize potentially dangerous areas, includes on highway and propose remedial measures. RSA Definition: It is a systematic approach for evaluating of new and existing roads by an independent team at different stages of planning, design, construction, operation and maintenance to achieve accident free roads and to increase overall safety performance. JSRPRCD (2012): defined road safety audit as formal procedure for assessing accident potential & safety performance in the provision of new road as well as maintenance, improvement, rehabilitation of existing roads. AUSTROADS (2002): describes it is a formal examination of a future road or traffic project or an existing road, in which an independent, qualified team report on the projects crash potential and safety performance. ADB (2003): defined RSA as systematic procedure for assessing the road safety of roads and road schemes.

N. Naveen (2017) Transportation plays a key role in the development of an area, but it happens only when the transportation is safe, rapid, comfortable and economy. A road is considered safe when only a few, or no accidents occur. Road and its surroundings, road users and vehicles are the elements contributing to road accidents. Pedestrians, bicyclists and two-wheeler motorized riders are the vulnerable road users. The loss of human life due to accident is to be avoided. Road safety audit (RSA) is a formal procedure for assessing accident potential and safety performance in the provision of new road schemes and schemes for the improvement and maintenance of existing roads. These Audit studies or analysis give scope for the reduction of accidents and helps us to provide safe, self-explaining and forgiving roads. By this we can save the precious human life as well as the nation's economy. The selected for this study is part of Hyderabad Outer and Inner Ring Roads, HMDA Roads. Knowledge of accidents that have occurred on roads helps us to improve the design of the roads or to influence the behaviour of road users, so that similar accidents do not occur again. Literature review will be done for the safe movement of the Road safety audit and will check the merits and demerits of the techniques used previously.

General Observations and Study Application

Horizontal and Vertical Curve details: Design of horizontal curves were checked to ensure whether adequate super elevation, transition lengths have been provided for chosen radius of curve and for particular design speed. Vertical curves were checked for minimum curve length to be adopted for specific change in grade to have adequate sight distances. The horizontal and vertical curves are designed as per IRC requirements and no major deficiency has been observed in the design.

Crash Barrier locations: The crash barriers have been provided on embankments whose height is more than 3.0m, at major and minor bridge approaches and sharp curves. Crash barrier is not properly connected with bridge concrete crash barrier at many locations. There should be no gap between Metallic crash barrier and rigid concrete crash barrier. In the approaches of structures, it should be extended up to the end of approach.

Major Junction Locations: Geometrical improvements at many of the major junctions are not started due to hindrances and some are in progress. Grading and linking of minor arms to project road are pending in most of the junctions and are held-up due to one or the other reason. Lane Marking and installation of high mast lighting on the project road at all junctions is yet to be completed. Installation of road studs has to be done in all junctions. Object / hazard markers are to be provided within the channelizing and divisional island facing traffic to warn the drivers in advance.

Minor Junction Locations: Lane marking, 'STOP' line marking, directional arrows, pedestrian markings etc, have to be done in all the junctions. As per IRC, it is necessary to provide road hump on minor arms at a distance of 10m from edge of project road to regulate the speed of vehicles entering the project road. 'STOP' signs are to be properly installed on minor arms and shall be located at a distance of 3m from 'STOP' line and aligned perpendicular to face the oncoming traffic

Grade separator and Vehicular underpass Locations: Adequate vertical clearances have been provided under all the flyovers and vehicular underpasses. Geometrical improvement of at-grade road needs to be taken-up with proper channelizing islands for uninterrupted traffic movements.

Sign posts, Hazard markers and Road Studs: Speed limit sign boards and informatory sign boards have to be installed at merging and diverging lanes of service roads, major junctions, petrol pumps and hospitals. Delineators shall be provided along the edge of longitudinal curve. It is desirable to provide road studs have to be provided along centre and edge line of all horizontal curves. Hazard markers shall be provided for channelizing and divisional islands at all major junctions, median openings, before parapet of CD structures/bridges, before crash barrier, before vertical posts/columns of over head gantry sign boards resting on shoulders. All signs are reflectorised type with high intensity retro-reflective sheeting of encapsulated type has been provided.

Lighting arrangement: Adequate lighting arrangement is in progress on flyovers and on at grade roads in town limits. High mast lighting has to be provided at some locations. Lighting arrangement is also required below slab in vehicular underpasses. All major and minor junctions of the highway should be facilitated with high mast lighting arrangement for safe movement of vehicular traffic and pedestrians.

Pavement Marking: Lane marking was completed in majority of road sections. Pedestrian cross marking at school, hospital, town/village limits, bus bays, VUP and PUP locations shall have to be carried out for safe movement of pedestrians.

Pedestrian facilities locations: Raised foot path needs to be provided in town and village area for safety of pedestrians. Raised foot path is in progress at bus bay locations. Pedestrian guardrail shall be provided at the places where pedestrian activity is high and on raised foot path on the side of carriageway at bus stops and bus bays for adequate length but not less than 20 m on either side for pedestrian safety.

Bus bay & Truck lay bye locations: Informatory sign boards shall be installed ahead of the bus bay and truck lay byes. Pavement marking needs to be carried out. Raised pedestrian footpath needs to be constructed for safety of passengers. Proper transition in carriageway shall be provided.

Speed regulatory measures at junctions: As per Indian Road Congress specification, it is necessary to provide road hump with necessary sign boards on minor arms at a distance of 10m from the edge of main carriageway to regulate the speed of vehicles entering the project road.

Locations of vehicular skidding and surface pounding: There were no locations with excessive bleeding and corrugations in pavement surface. Median opening/median drains for efficient drainage of surface water is under construction in super elevated sections. On high embankments, rain cuts have been observed on the earthen slopes. This needs to be rectified. Excessive filling in medians have resulted in spilling over of earth on carriageway in some of the stretches. This needs to be removed by dressing the filled earth to kerb height or even less.

Toll Plaza: Toll plaza with various facilities is still under construction and to be completed. Proper lanes marking with adequate channelization have to be provided at toll plaza. Lighting to meet required lux level along with high mast lighting shall be provided as per the requirements of the project. Proper flaring in carriageway shall be provided. Highway patrolling: The pavement maintenance agency should provide route patrols round the clock to assist motorists. The patrol personnel should be adequately trained in traffic management, road safety and in primary First Aid. The road agency should also provide ambulances having all facilities of

emergency assistance required like stretcher to carry the patient, Emergency Medicines, oxygen etc. The Concessionaire should have cranes of sufficient capacity having all requisite arrangements of pulling and lifting of accidental/break down vehicles.

Service Roads: Service Roads are to be constructed in habitant areas which are still to be completed in the some stretches. Proper flaring at start and end of Service Roads should be provided before merging or diverging. Road signs should also be installed at all flaring locations. Proper chevron marking should be provided at start of separator between Main Highway and Service Road. Hazard Marker shall also be installed at start of divider.

Drainage: Pucca Drain is provided in Urban Areas / Service Roads which is in progress. It is noted that Gratings are to be provided for outfall of water in the drain. These drain should be covered to ensure safety of pedestrian.

Median openings: Most of the Median openings have been provided with storage lane for 'Uturn' vehicles. 'STOP' line and 'U-turn' marking has to be taken-up to guide the drivers properly. No vegetations have to be planted in median (up to 100.0m) to maintain clear sight distance at median opening locations. Median opening sign boards have been installed in most of the locations. Arrow marking is still to be done in storage lanes. It is observed that at some locations of the project stretch, the local people were damaging the median kerbs and using as unauthorized median openings. These should be restricted and all such openings should be closed.

DATA COLLECTION

The accident situation in general is very serious and more worrisome in large cities which accounts for maximum number of accidents. Most of the accidents happening on any road network have 2 main causing factors, one is carelessness of driver and another is deficiency of road safety awareness of the road users. For this purpose, the road safety audit carried out on the stretch: "BALSAMAND-HISAR BYPASS on MDR 107".

In this study various road safety aspects of BALSAMAND-HISAR BYPASS (MDR 107) has been analysed using relevant IRC guidelines. Constituents of road furniture's are as follows

- A. Road Marking
- B. Road Signals
- C. Guard Rails
- D. Delineators
- E. Road Signs

COLLECTED DATA

Balsamand-Hisar Bypass Road (MDR 107)

This road was selected for analysis of road safety aspects and the observations are noted as in following table:

Table – Condition of road furniture on MDR 107 between 0-23 Kms

DISTANCE (km)	ROAD SIGNS	ROAD MARKING	GUARD RAILS	DELINEATORS
0-1	Not provided	Not provided	-	-
1-2	Not provided	Not provided	-	-
2-3	Not provided	Not provided	Not provided	Not provided
3-4	adequate	Inadequate	-	-
4-5	adequate	Inadequate	-	-
5-6	-	Inadequate	adequate	Inadequate
6-7	1.No turn sign 2. no limited height sign	Inadequate	-	Not provided
7-8	-	Inadequate	-	-
8-9	No bus stop sign	Inadequate	-	-
9-10	-	Inadequate	-	-
10-11	-	adequate	-	Not provided
11-12	adequate	adequate	-	-
12-13	-	adequate	-	-
13-14	No sign for curve	adequate	-	Not provided
14-15	adequate	Inadequate	-	-
15-16	adequate	adequate	-	-

16-17	-	Inadequate	-	-
17-18	adequate	adequate	-	-
18-19	adequate	adequate	-	-
19-20	no warning sign for curve and pond	adequate	Not provided	-
20-21	adequate	adequate	-	-
21-22	-	adequate	-	-
22-23	Broken informatory sign	Inadequate	-	-

Road Signs

Locations where road signs should be provided along with their present status are shown in table. The status of road signs is divided into three categories viz.

1. Adequate: Where road signs are provided as per guidelines in IRC: 67-2012.
2. Inadequate: Where road signs are provided but they are not as per IRC guidelines. For example: broken, defaced, misleading, faded, etc.
3. Not provided: Where road sign should be provided.

Table – Location and status of Road Signs on MDR 107

DISTANCE (km)	TOTAL NO. OF LOCATIONS	STATUS OF ROAD SIGNS		
		ADEQUATE	INADEQUATE	NOT PROVIDED
0-1	1	-	-	1
1-2	0	-	-	-
2-3	4	2	-	2
3-4	1	1	-	-
4-5	1	1	-	-
5-6	0	-	-	-
6-7	2	-	-	2
7-8	1	-	-	1
8-9	1	-	-	1
9-10	0	-	-	-
10-11	0	-	-	-
11-12	1	1	-	-
12-13	0	-	-	-
13-14	2	-	-	2
14-15	1	1	-	-
15-16	2	2	-	-
16-17	0	-	-	-
17-18	1	1	-	-
18-19	1	1	-	-
19-20	2	-	-	2
20-21	1	1	-	-
21-22	0	-	-	-
22-23	3	1	1	1
TOTAL	25	12	1	12

Road Markings

Locations where road Markings should be provided along with their present status are shown in TABLE. The status of road markings is divided into three categories viz.

1. Adequate: Where road markings are provided as per guidelines in IRC: 35-2015.
2. Inadequate: Where road markings are provided but they are not as per IRC guidelines. For example: misleading, faded, etc.
3. Not provided: Where road markings should be provided.

Table – Location and status of Road Markings on MDR 107

DISTANCE (KM)	TOTAL NO. OF LOCATIONS	STATUS OF ROAD MARKINGS		
		ADEQUATE	INADEQUATE	NOT PROVIDED
0-4	4	-	2	2
4-10	6	-	6	-
10-15	5	4	1	-
15-18	3	2	1	-
18-23	5	4	1	-
TOTAL	23	10	11	2

Guardrails

Locations where guardrails should be provided along with their present status are shown in TABLE. The status of guardrails is divided into three categories viz.

1. Adequate: Where guardrails are provided as per guidelines in IRC: 67-2012.
2. Inadequate: Where guardrails are provided but they are not as per IRC guidelines. For example: not embedded properly, not provided where height of embankment is greater than 3 meters, etc.
3. Damaged: Where guardrails are damaged.

Table – Location and status of guardrails on MDR 107

DISTANCE (km)	TOTAL NO. OF LOCATIONS	STATUS OF GUARDRAILS		
		ADEQUATE	INADEQUATE	DAMAGED
0-7	2	1	1	-
7-14	0	-	-	-
14-23	1	-	1	-
TOTAL	3	1	2	0

Delineators

Locations where delineators should be provided along with their present status are shown in TABLE. The status of delineators is divided into three categories viz.

1. Adequate: Where delineators are provided as per guidelines in IRC: 79-1981.
2. Inadequate: Where delineators are provided but they are not as per IRC guidelines. For example: broken, misleading, faded, etc.
3. Not provided: Where delineators should be provided.

Table – Location and status of delineators on MDR 107

DISTANCE (km)	TOTAL NO. OF LOCATIONS	STATUS OF DELINEATORS		
		ADEQUATE	INADEQUATE	NOT PROVIDED
0-10	4	1	2	1
10-23	2	-	-	2
TOTAL	6	1	2	3

CONCLUSION

From the study of the above corridor leads to the following conclusions:

1. The geometric deficiencies like non availability of parking lane at village area and intersections, speed bumps before approaching village area.
2. Vehicle operations are not satisfactory near Aryanagar Village because of over saturated condition.
3. No zebra crossing in village area, absence of Informatory signs along the route and where they exist, they are not in good condition, unauthorized parking at intersection and along the route and village area etc. leads to accidental hazard.
4. There is lack of traffic signals at some crucial intersection. In peak hours Hisar Bypass Chowk is controlled manually.
5. The earthen shoulder is not properly maintained and lack of parking spcae at entire stretch.
6. The heavy volume of 4-wheelers and Heavy Commercial Vehicles and 2-wheeler at Aryanagar, leads to decrease in the road width for the through traffic. This creates the situation of bottleneck and in the end leads to crash at several locations.

References

- [1] Agarwal P. K. and Mehar R. (2013) "A Methodology for Ranking Safety Hazardous Locations Using Analytical Hierarchy Process" 2nd Conference of Transportation Research Group of India (2nd CTRG), 104 (2013) 1030-1037.
- [2] Dr Jain. S.S. and Singh P.K. (2011) "Road Safety Audit for Four Lane National Highways", 3rd International Conference on Road Safety and Simulation 14-16, 2011, Indianapolis, USA.
- [3] Golob T. F. et. Al. (2004), "Tool to Evaluate Safety Effect of Changes in Freeway Traffic Flow", Journal of Transportation Engineering, vol. 130 @ ASCE.
- [4] Hakkert A. S. and Victoria Gitelman (2014) "Thinking about the history of road safety research: Past achievements and future challenges", Transportation Research Part F 25 (2014)137-149.
- [5] Lad R. J. and Patel B. N. (2013) "Identification of Black Spot in Urban Area", Indian Journal of research, vol 2 |ISSUE-4|ISSN-2250-1991.
- [6] Luca M. D. et. Al. (2012) "Procedure to identify the black spots". Elsevier Ltd. Selection and/or peer-review under responsibility of SIIV scientific Committee, 53 (2012) 703-711.
- [7] Michalski L. and Gaca S. (2014) "Tools for road infrastructure safety management- Polish experiences" 17th Meeting of the EURO working group on Transportation, (2014) 730-739
- [8] Parikh V. A. and Dr. Jain A. M. (2014) "Road Safety Audit: Development of an accident model for Urban area", International Journal of Engineering and Research, vol 2, issue 2|ISSN:2321-9939.
- [9] TarekSayed et. Al (2011), "Transferability of Community-Based collision prediction Models for uses in Road Safety Planning Applications", Journals of Transportation Engineering, vol. 136, @ASCE.
- [10] AASHTO, Highway Safety Design and Operations Guide 1997, Washington, D.C.

